BreezeMAX® Extreme 5000

Product Release 1.5
GA Release Note

August 2010

© Alvarion Ltd. All rights reserved.

The material contained herein is proprietary, privileged, and confidential. No disclosure thereof shall be made to third parties without the express written permission of Alvarion. Alvarion reserves the right to alter the specifications in this publication without prior notice.

General

This document details the main hardware elements, software features, known limitations, bug fixes, and version compatibility information as well as the documentation available for the BreezeMAX Extreme 5000 product release 1.5. It corresponds to software versions:

- Software version 1.5.1.72 of BreezeMAX Extreme 5000 base-station
- Software version 1.5.1.23 of BreezeMAX PRO 5000 CPE

Note: This is a 2nd release of Product Release 1.5, that includes several bug fixes over earlier version 1.5 (BTS version 1.5.1.57, and CPE version 1.5.1.16), for the list of bug fixed please refer to the relevant sections below.

The Product Released

BreezeMAX Extreme is a state-of-the-art all-outdoor, all-in-one WiMAX 16e (IEEE 802.16e-2005) based platform, working in the 5.x GHz band, operating in TDD, and intended for worldwide use.

BreezeMAX Extreme offers all the advantages of the WiMAX 16e to the license-exempt frequency bands. Leveraging the carrier class QoS along with the superior radio technology, formed in a small all-outdoor highly integrated design presenting an exceptionally attractive cost/performance ratio for various needs and deployment scenarios, improving operational costs and reducing complexity.

The BreezeMAX Extreme base-station comes in two frequency configurations:

- 4.9 model - supports 4.90-5.35 GHz
- 5.4 model - supports 5.47-5.95 GHz

The BreezeMAX Extreme PRO CPE covers the entire 1GHz band in a single model.

With BreezeMAX Extreme release 1.5 the following country profiles are allowed for use, any other country profile is prohibited:

4.9 GHz Extreme model (4.9-5.35)	**5.4 GHz Extreme model (5.47-5.95)**
Universal	Universal
Canada	Canada
FCC	Australia
ETSI	ETSI
5.1 GHz FAA	FCC

Important notes:

ONLY experienced installation professionals who are familiar with radio equipment for outdoor/indoor, local radio regulations, relevant local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities should install outdoor units and antennas and should do so in accordance to the local regulations applicable.

About this Release

Release 1.5 of the BreezeMAX Extreme is based on release 1.2 and introduces enhancements and new features as well as new models. Release 1.5 introduces the following new elements and capabilities.

Extreme BTS Product Models

New in this release:

- Dual Sector SISO – A Single Input Single Output solution, serving two sectors in a single box, external antenna only. Supports up to 10MHz per each served sector.

P/N	Product	Description
949004	XTRM-BS-2SIS-4.9-Ext	BMAX Extreme BTS, dual sector (2x10MHz) no diversity, 4.9-5.35GHz band. Mounting kit included. Power Supply, External antennas, and indoor to outdoor cable are NOT included and should be ordered separately.
954004	XTRM-BS-2SIS-5.4-Ext	BMAX Extreme BTS, dual sector (2x10MHz) no diversity, 5.47-5.95GHz band. Mounting kit included. Power Supply, External antennas, and indoor to outdoor cable are NOT included and should be ordered separately.

- Limited models for lower entry price –
  - Available for all HW models – SISO, MIMO and Dual-SISO
  - Limited to 20 CPEs per base-station
  - Working with integrated ASN only
  - License upgrades available for easy "pay as you grow":
    - Upgrade to 50, 100, 150, 250, or directly to 250. (upgrade to 250 also enabled the external ASN-GW)

P/N	Product	Description
954010	XTRM-BS-1SIS-5.4-Lm90	BMAX Extreme BTS, single sector, no diversity, 5.47-5.95GHz band, attached 90 degrees single slant antenna. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply and indoor to outdoor cable are NOT included and should be ordered separately.
954011	XTRM-BS-1SIS-5.4-LmEx	BMAX Extreme BTS, single sector, no diversity, 5.47-5.95GHz band. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply, External antenna, and indoor to outdoor cable are NOT included and should be ordered separately.
954012	XTRM-BS-1DIV-5.4-Lm90	BMAX Extreme BTS, single sector, 2nd order diversity, 5.47-5.95GHz band, attached 90 degrees dual slant antenna. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply and indoor to outdoor cable are NOT included and should be ordered separately.

P/N	Product	Description
954013	XTRM-BS-1DIV-5.4-LmEx	BMAX Extreme BTS, single sector, 2nd order diversity, 5.47-5.95GHz band. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply, External antenna/s, and indoor to outdoor cable are NOT included and should be ordered separately.
954014	XTRM-BS-2SIS-5.4-LmEx	BMAX Extreme BTS, dual sector (2x10MHz) no diversity, 5.47-5.95GHz band. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply, External antennas, and indoor to outdoor cable are NOT included and should be ordered separately.
949010	XTRM-BS-1SIS-4.9-Lm90	BMAX Extreme BTS, single sector, no diversity, 4.9-5.35GHz band, attached 90 degrees single slant antenna. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply and indoor to outdoor cable are NOT included and should be ordered separately.
949011	XTRM-BS-1SIS-4.9-LmEx	BMAX Extreme BTS, single sector, no diversity, 4.9-5.35GHz band. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply, External antenna, and indoor to outdoor cable are NOT included and should be ordered separately.
949012	XTRM-BS-1DIV-4.9-Lm90	BMAX Extreme BTS, single sector, 2nd order diversity, 4.9-5.35GHz band, attached 90 degrees dual slant antenna. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply and indoor to outdoor cable are NOT included and should be ordered separately.
949013	XTRM-BS-1DIV-4.9-LmEx	BMAX Extreme BTS, single sector, 2nd order diversity, 4.9-5.35GHz band. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply, External antenna/s, and indoor to outdoor cable are NOT included and should be ordered separately.
949014	XTRM-BS-2SIS-4.9-LmEx	BMAX Extreme BTS, dual sector (2x10MHz) no diversity, 4.9-5.35GHz band. Mounting kit included. Limited to 20 SUs per BTS (license upgrade available). Power Supply, External antennas, and indoor to outdoor cable are NOT included and should be ordered separately.

Supporting also the previously available models:

- Single Sector SISO – A Single Input Single Output solution, serving a single sector, comes with either integrated or external antenna
- Single Sector MIMO – A Multiple Input Multiple Output solution, serving a single sector, comes with either integrated or external antenna

Extreme CPE Product Model

New in this release:

- Outdoor, MIMO CPE, 2Rx 1Tx, external antenna model (2 N-Type connectors)

P/N	Product	Description
950302	XTRM-SU-OD-1D-4.9-2-E	1 data port Subscriber Unit for external antenna. Outdoor radio unit 4.9-5.9 GHz with N-Type connectors for external antenna, 2Mbps data rate, 2xRX diversity. Indoor Unit (IDU), external antenna, and indoor to outdoor cable are NOT included and should be ordered separately.
950304	XTRM-SU-OD-1D-4.9-6-E	1 data port Subscriber Unit for external antenna. Outdoor radio unit 4.9-5.9 GHz with N-Type connectors for external antenna, 6Mbps data rate, 2xRX diversity. Indoor Unit (IDU), external antenna, and indoor to outdoor cable are NOT included and should be ordered separately.
950308	XTRM-SU-OD-1D-4.9-UL-E	1 data port Subscriber Unit for external antenna. Outdoor radio unit 4.9-5.9 GHz with N-Type connectors for external antenna, unlimited data rate, 2xRX diversity. Indoor Unit (IDU), external antenna, and indoor to outdoor cable are NOT included and should be ordered separately.

Supporting previously released:

- Outdoor, MIMO CPE, 2Rx 1Tx, Integrated dual-slant antenna

End-to-end System Components

New in this release:

- GPS chaining cable

P/N	Product	Description
935010	XTRM-CBL-GPS-CHAIN-5	Extreme base-station GPS chaining cable - 5m. RJ45 crimped (without boot) in both ends

- External base-station dual-slant antenna

P/N	Product	Description
300717	ANT BS 5xGHz,16dBi, 90DS 2 ports	Sectorial antenna, 90 deg. Dual-slant polarity ±45°. 4.9-5.95 GHz. Terminating connectors: 2 x N-Type female. Gain: 16dBi. Cables should be ordered separately.

- Cost optimized power supply (indoor) for the CPE

P/N	Product	Description
960003	XTRM-SU-IDU-1D	BreezeMAX Extreme subscriber unit standard Indoor unit - BreezeMAX Data Bridge Indoor Module with one 10/100 Base-T Data Port. Cable to Mains is NOT included and should be ordered separately.

- New license features for the Base-station

P/N	Product	Description
950201	XTRM-LIC-Ext-Channel-BW	Software license - Support for extended channel bandwidth 10+10MHz. Relevant for single sector (SISO or MIMO) models

P/N	Product	Description
950202	XTRM-LIC-SCL-20-to-50	Scale from 20 up to 50 subscribers per BTS. Relevant for Limited subscribers BTS models ("Lm")
950203	XTRM-LIC-SCL-50-to-100	Scale from 50 up to 100 subscribers per BTS. Relevant for Limited subscribers BTS models ("Lm")
950204	XTRM-LIC-SCL-100-to-150	Scale from 100 up to 150 subscribers per BTS. Relevant for Limited subscribers BTS models ("Lm")
950205	XTRM-LIC-SCL-150-to-250	Scale from 150 up to 250 subscribers per BTS. Relevant for Limited subscribers BTS models ("Lm")
950206	XTRM-LIC-SCL-Ultimate	Scale (from any number of subscribers) up to 250 subscriber units per BTS, open external ASN interface. Relevant for Limited subscribers BTS models ("Lm")

- IOT with the external 4Motion mini-centralized ASN-GW
- IOT with FreeRADIUS AAA server

Supporting also:

- All-outdoor Extreme BTS, with the following integrated capabilities
  - ASN-Gateway
  - GPS receiver
  - Integrated dual-slant antenna (external antenna model also available)
  - Local provisioning option (no AAA mode)
- PoE to feed the BTS
- BTS cabling for power (PoE or DC), data, external antennas
- GPS antenna kits (Basic and High-Profile models)
- Sector Antennas (for external antenna model)
- Outdoor CPE
- PoE to feed the CPE
- SAU – Subscriber Alignment Unit, for ease of installation and alignment of CPEs
- AAA IOT: Radiator (verified with version 4.4), Alepo (verified with version 7)
- ASN IOT: Integrated, external over R6
- NMS:
  - AlvariSTAR – Network Management System
  - StarACS – TR69 based CPE Management System
- Installer Aid:
  - AlvariCRAFT – Element Management and Installation Assistance Application

Main Features

The following new features and functionalities are supported with this release.

- **MIMO B increased capacity**

  Available in the diversity base-station models (DIV), enabling increased served capacity in the downlink. A new sector diversity mode is supported (MIMO matrix A&B), on top previous modes (MIMO matrix A). Under MIMO A&B the system automatically selects per each subscriber according to its link conditions and subscriber capabilities if it uses matrix A (for increased coverage gain and link robustness) or matrix B (for increased capacity).

- **Extended bandwidth support (10+10 MHz)**

  Increasing the served bandwidth of single sector models (either SISO or MIMO) for dual carrier – 10+10 MHz by a single base-station, and hence practically doubling the served capacity. This feature is available under feature license (950201).

  Note that the CPE (working at 10MHz) would associate to either of the dual-carrier BTS, it is recommended that the BS_ID of each 10MHz would be configured differently such that sector "load balancing" can be achieved by setting the preferred BS of part of the CPEs equally between the two different BS IDs.

- **Dual SISO sector configuration support**

  A new base-station model, serving two different sectors with Single-Input-Single-Output. Each of the sectors would be separately configured, and may serve up to 10MHz per each sector. This model creates a great offering for lower teledensity deployments, leveraging a single housing, single ASN, single feeding and backhaul for the two sectors.

- **GPS chaining capability**

  Starting release 1.5, deploying a multi-sector site can benefit from chaining the GPS signal between the BTS in the site.

  One BTS acts as master and connects to the GPS antenna. The rest of the BTS on site (up to 4 additional BTS) are daisy-chained using CAT5e cable (in GPS-out, GPS-in connectors or the BTS).

  The base-stations are configured according to their position in the chain, and in case that the master would fail to generate the 1 PPS signal, the BTS configured as 1 in the chain would generate to the others, in case it would fail BS#2 in the chain would generate, etc.

- **eRT Quality-of-Service Profile**

  eRT (Extended Real-Time) Quality of Service is designed to support real-time applications, such as VoIP with silence suppression, that have variable data rates but require guaranteed data rate and delay. eRT creates periodic allocations in the downlink and uplink for the voice traffic similar to UGS, but on-top UGS is suppresses silence and performs the allocations only when talk spurt is detected, as such it guarantees high voice quality of service with optimization of the air-link usage and capacity.

  For details on the various QoS parameters settings please refer to the system manual.

- **"Limited" models and feature-licensing**

  Starting with release 1.5, operators and integrators can benefit from "build-per-need" and "pay-as-you-grow" model. New models of base-station are available at lower entry price, limited to 20 subscribers per BTS, operable with the integrated ASN-GW only.

- **Extended cell-range**

  In a TDD scheduled protocol the max cell range is dictated by the silence duration between the DL and UL zones. Starting with release 1.5 operators can configure the max cell-range to be either 8km (as in previous releases) or 40km.

- **Enhanced Interference mitigation – MAPs repetition**

  As part of the transmission, the MAP is a very important part as it lays-out the frame structure and DL/UL allocations. If a CPE can not interpret the MAP due to high level of interference, it would discard the entire frame. To have a more reliable and resilient transmission starting this release you may configure the MAP repetition (x2, or x4 repetition) to have a higher reliability.

- **Enhanced Interference mitigation – BTS Spectrum Analyzer**

  For better initial site commissioning, and as a debugging tool, starting with Release 1.5 the base-station can perform spectrum analysis over a configured frequency range.

  The base-station scans over the configured frequency range the central frequencies. At each frequency it measures the RSSI (over all applicable sub-carrier frequencies), and calculates the median RSSI (of all sub-carriers).

  Note: The Spectrum Analysis test is a service affecting operation – during the scan the base-station would seize to serve the units associated to it.

- **Enhanced Interference mitigation – DCS**

  The DCS (Dynamic Channel Selection) mechanism is designed to find the most suitable channel (the one with least interferences) for operation among the configured range of channels (discrete list of channels). When the BS is turned on (startup) the DCS is triggered to select one of the best channels at the current time. The selection is based on Noise and Interference (NI) level measurements performed in all defined channels by the built-in spectrum analyzer. DFS (if applicable) will be triggered after the channel selection (for verification of the channel). A channel that is considered by the DFS mechanism as Unavailable will not be selected by the DCS mechanism.

  When using Random Channel Selection, the unit will select randomly channels in the relevant frequency band. In configurations with two sectors, the DCS mechanism will avoid selection of the channel used by the other sector.

  During normal operation (on-going status), spectral efficiency detectors triggers the DCS mechanism to search for a new channel when channel conditions cause performance degradation below a certain level.

- **Multicast & Broadcast profile**

  With release 1.5 you may benefit from downlink broadcast and multicast enhanced capabilities. The multicast profile is configured within the forwarding rule in the service profile. Up to 10 different multicast groups can be configured. The multicast transmission is performed only once over the air and is performed in the configured "basic rate". The service configuration includes the MIR for the multicast service.

- **Reliable video profile**

  A new quality of service profile for video applications, aiming to provide a reliable, error-free transmission.

- **Networking deployment enhancements – DHCP server, relay, and forwarding option 82**

  With release 1.5 we had enhanced the networking deployment options of Extreme, adding on-top the DHCP transparent mode also DHCP server, and DHCP forward and relay with option 82 support.

  - **Transparent:** As supported by previous releases. Typically used with IP CS service interfaces. The MS communicates directly with a DHCP server without involving the ASN-GW.
  - **Forward With Option 82:** Similar to the Transparent mode, with the ASN-GW adding Option 82 (Relay Agent Information) to DHCP messages forwarded to the backbone and removes them from

received messages before forwarding them to the MS. Any DHCP discovery/request message coming from the user that includes option 82 will be dropped.

- **Relay with Option 82:** The ASN-GW serves as a relay for DHCP messages between the MS and a known DHCP server. The implementation complies with RFC-2131 and RFC-3046. Any DHCP discovery/request message coming from the user that includes option 82 will be dropped.
- **Server:** The ASN-GW acts as a DHCP server

- **Default gateway per service group**

  In IP-CS mode, ability to configure a different default gateway per each service group.

- **Default Service Profile & Default MSF**

  For easier service definition "templates" of defaults for service profile and MSF are available.

- **Best AU Enhancements**

  Enhancement of the Best AU mechanism. With release 1.5 the CPE supports automatic periodic search for its preferred AU in case it is not currently associated to it.

  This means that the best-AU, preferred-AU mechanism works in accordance to:

  - The CPE performs scanning over the configured range (start/stop range + discrete list of frequencies) and creates a short-list of the found AUs in the range that comply with the best-AU mask
  - In case the CPE finds the preferred AU in the short-list it would associate to it
  - In case the preferred AU is not found the CPE would associate to the AU with the best signal quality.
  - In case the CPE is associated to a BTS that is not its preferred AU, it would trigger automatic rescan each configured period to look for the preferred AU

- **Ethernet CS Enhancements**

  Two additional enhancements were added on top the previously existing capabilities:

  - Deny/Allow MAC Address/Ranges – a new security feature, introducing filtering mechanism to allow/deny service to specific end user devices based on their MAC Address. Configuration can be done also over a MAC Address range.
  - A new classifier by Source MAC Address, enabling CPE management over ETH CS

- **Country code setting improvements**

  As the base-station model supports a wide-range of frequency, we had modified the country code settings to cover regulation, followed by frequency band. As such, operator can benefit from using a multi-band (e.g, 5.4 and 5.8) settings, while maintaining correct settings (e.g. Tx power mask, DFS, etc) per each range.

- **Backhaul CPE support**

  Improved deployment scenario – when feed by direct 48V DC, the base-station may feed the backhaul CPE (e.g. BNB, VL, or even an Extreme CPE).

- **BTS link statistics**

  Modulation counters per each rate in the downlink and uplink, with indication of MIMO A and MIMO B in the downlink. Further there is ability to view continuous CINR/RSSI per each active MSs.

Network Management Support

Base Station Management

The BreezeMAX Extreme base station is managed either by AlvariCRAFT as single element management (installer assistance), AlvariSTAR as a Network Management System or via Telnet.

Release 1.5 of BreezeMAX Extreme Device is supported starting from Infrastructure version 4.5.0.46 of AlvariSTAR and AlvariCRAFT.

AlvariSTAR Infrastructure 4.5.0.46 version has to be installed on AlvariSTAR platform with Extreme Device Driver 1.5.0.46.

CPE Management

The BreezeMAX PRO CPEs are managed either through a web interface for a single element management or over TR-69 using the StarACS CPE management system.

Release 1.5 of BreezeMAX Extreme is supported starting StarACS version 2.8.5.5

Documentation

- There are two major independent manuals, the Base Station System Manual and the CPEs Product Manual. Each manual covers all relevant topics associated with the respective equipment, including:
  - Product / system description
  - System installation
  - Commissioning
  - Operation and administration.
- The documentation includes the following:
  - BreezeMAX Extreme Base Station System Manual
  - BreezeMAX Extreme Base Station Quick Installation Guideline
  - BreezeMAX Extreme CPEs Product Manual
  - BreezeMAX Extreme CPE Quick Installation Guideline
  - BreezeMAX Extreme Traps and Alarms
  - AlvariSTAR User Manual (part of AlvariSTAR CD)
  - AlvariCRAFT User Manual (part of AlvariSTAR CD)
- The following documents are also available:
  - BreezeMAX Extreme 5000 BTS Technical Specifications
  - BreezeMAX Extreme CPE PRO 5000 Technical Specifications
  - BreezeMAX Extreme Software Upgrade Procedure (to release 1.5)
- The following applications notes are also available:
  - Application Note: Preparing cables for the BreezeMAX Extreme
  - Application Note: BreezeMAX Extreme operating with AAA
  - Application Note: BreezeMAX Extreme operation under local provisioning

Upgrading Software to Release 1.5

Please note that upgrading the software to release 1.5 involves several steps and recommendations. A dedicated document to cover the upgrade procedure for both BTS and the CPE is available.

The following is a general description:

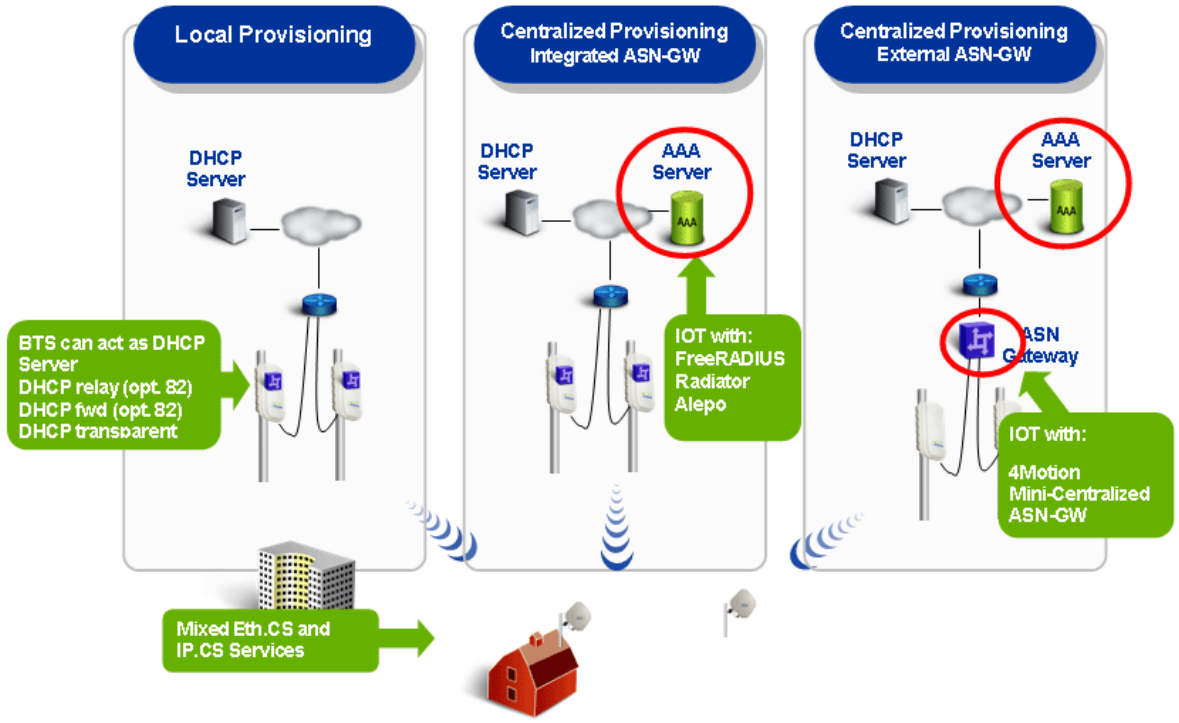
- BTS upgrade to release 1.5 should include update of the firmware version as well as update of the Country Code configuration files (two files, named COUNTRY_CODES.sig and RFU_HEADS.sig);
- PE upgrade to release 1.5 from release 1.1 involves 2 steps:
  - Upgrade from release 1.1 to an interim version (1.2.0.3)
  - Upgrade from the interim release to the official release (1.5.1.23)
- CPE upgrade to release 1.5 from the 1.2 official release can be performed directly, without an intermediary version;
- CPE upgrade can be performed either through the LAN or over the air;

Note:

- In some particular cases, the 1.2 CPE SW Version is not compatible with the 1.5 BTS SW Version. In order to minimize the downtime for SW Upgrades, it is recommended that the CPEs be upgraded *BEFORE* the BTSs to their respective 1.5 official releases. This will ensure there will be no compatibility issues in the upgrade procedure.
- Upgrading the Country Code files (COUNTRY_CODES.sig and RFU_HEADS.sig) as stated above is highly recommended in all cases, it is mandatory for the following cases:
  - When using Australia country code 5.8
  - In order to use 5 MHz BW in ETSI or FCC (at either 5.4 or 5.8).

Please refer to the software upgrade technical note for the step by step and further details on software upgrade procedure.

Supported Deployment Scenarios



	Local Provisioning	Distributed Integrated ASN	External ASN
AAA	Not required	**FreeRadius** Radiator Alepo	From 4Motion Portfolio: Alepo Bridgewater
ASN-GW	Extreme Integrated	Extreme Integrated	**4Motion Mini-Centralized**
Service Type	Fixed	Fixed / Nomadic	Fixed / Nomadic / Mobile*
Authentication / Provisioning	SU MAC (on BTS)	User Name + Password	User Name + Password
Encryption	None	16e based (keys by AAA)	16e based (keys by AAA)
Eth. CS	Yes	Yes	No
IP CS	Yes	Yes	Yes

*In future release

Recommendations / Important Notification

When deploying the BreezeMAX Extreme 5000, please refer to the following recommendations:

1. Base Station ID configured in each channel must be unique in the entire network. Specifically when operating a dual-carrier BTS (e.g. 10+10) it is recommended to configure a unique BTS ID per each carrier to enable load-balancing.
2. The quality-of-service service profile configurations supported with this release are – BE (Committed Priority; CP=0), nRT (CP=1, 2 is supported), and eRT (CP=3 to 7).

   Suggested services configuration:

   a. Data: BE

   b. CPE Management (TR-069): nRT=1

   c. Voice: eRT=5.
3. In the external AAA, the re-authentication timer (AK Life time) should be set to a value higher than 1hour.
4. When operating with external provisioning (AAA), if connectivity with AAA is lost the BTS will continue to function with previously authenticated MSs. When connection with AAA is reestablished the entire cell will be authenticated again (automatic de-registration of all CPE).
5. When working in IP-CS mode with a router behind the CPE, it is recommended to set the "Ethernet Downtime" on the CPE to be sufficient for the router to detect that the PHY is down and apply a DHCP renew – the value may vary between various router vendors.
6. The MAC address stated on the CPE label represents the LAN MAC address. The CPE WAN MAC address (used for instance for local provisioning of the SU) is according to the following rule:

   WAN MAC = LAN MAC + 1
7. When installing GPS antennas it is highly recommended to follow GPS antennas and receiver installation instruction and install the GPS antennas under clear sky.
8. When deploying a multi sector site it is recommended using a single high profile GPS antenna kit along with GPS chaining cable (CAT5e cable) between the base-station on the same site.
9. When performing software upgrade for the BreezeMAX Extreme CPE through the StarACS the behavior is as following:

   a. Software is downloaded to the unit

   b. Upon successful completion the unit set automatically "run from shadow" and performs reset itself.

   c. After link with BTS is established, the new version is Set as main automatically by the device
10. In case of using country code with DFS: We recommend using up-tilt kit for the CPE in case installed at the proximity of the base-station (typically in case of within 300m radius under CLOS) and adjust the up-tilt such that the max received signal from the CPE does not exceed -65dBm, this is to refrain from false DFS detection by the BTS.
11. DHCP server for the CPE management IP or the hosts behind the CPE should not contain the IP addresses pool range of 192.168.254.0 to 192.168.254.255. This is mainly since IP address 192.168.254.251/24 is the static local IP address (from the LAN) and as such reserves this subnet for local CPE provisioning.
12. When migrating a network from IP-CS to Eth-CS the following is recommended:

    a. Upgrade the entire network (CPE + BS) to release 1.2 or later

    b. Define new forwarding rule to be used with the Ethernet CS service

c. Define new service interface (as Eth.CS), associate to it the forwarding rule you've created in step 'b'.

d. Update the desired Multiple Service Flows with the new service interface you have created.

e. Update the Service Profile type per your needs (e.g. you may change the service from Data to PPPoE)

f. De-register the MS to have the new setting in affect

13. In order to downgrade to release 1.1, all the service interfaces and services defined should be of IP-CS before the downgrade itself.
14. When working with External ASN-GW, please make sure that the networking device between the BTS and the ASN-GW supports MTU bigger than 1500
15. When using forwarding with option 82, if the Service Group gateway is a Cisco router the following configuration must be add on the Cisco to permit the DHCP packets to pass: “ip dhcp relay information trust-all“
16. If additional devices are between the access router and BTS, these should forward without modification the DSCP marking. On CISCO switches the command is “mls qos trust dscp”
17. When using Linux DHCP server, the default setting should be that the DHCP Offer is sent as broadcast.
18. After switching between Operation Modes (e.g. between a SINGLE-SECTOR-SINGLE-BS to SINGLE-SECTOR-DUAL-BS), please make sure you are updating the bandwidth and central frequency to the desired values (e.g. from 10MHz to 20MHz).
19. When a base-station operates in 20MHz (10+10MHz dual carrier) the actual used channels by each of the carriers is offset by ±BW/2. i.e. when operating with 10+10MHz (set in the BS as 20MHz), each one of the dual carriers would be ±5MHz than the configured central frequency. As the CPE is always operating with 10MHz the central frequency it should look for one of these BWs.

Known Issues and Limitations

With Release 1.5 described herein, the BreezeMAX Extreme 5000 system is introduced with the following limitations:

Base-Station

1. The Ethernet port supports only Auto Negotiation mode.
2. The quality-of-service service profile configurations supported with this release are – BE (with CP=0), nRT (with CP=1 or 2), and eRT (with CP=3 to 7).
3. 5GHz: 5725MHz frequency is not supported and should not be used.
4. The GPS synchronization may take up to 30min when installing the base station in a new location, installer may refer to the GPS Menus as detailed in the system manual
5. Upgrade to Release 1.5 involves also update of the following files: COUNTRY_CODES.sig, RFU_HEADS.sig, ODU_bands.sig
6. Ethernet CS is supported only with the Integrated ASN-Gateway. i.e. when working with external ASN-GW only IP-CS services are supported.
7. Classification by VLAN ID = 4096 is not supported
8. PPPoE service is using EtherType classification only, any other configured classifier is ignored.
9. As under PPPoE the accounting is typically performed by BRAS, Account Start and Account Stop messages are not sent under PPPoE service profile.
10. Any service modification requires MS de-registration in order to take place.

11. The same convergence sub-layer (either IP-CS or Eth-CS) should be used for all services on the MS. The only exception is the CPE management all the other services (either DATA, VOICE or PPPoE) should use the same convergence sub-layer.
12. IP addresses that are not learned through DHCP process when the service is IP CS will not be allowed to perform traffic. If static routes are added to a device acting as DHCP client the routed classes will not perform traffic.

Newly Added with Release 1.5

13. Two service flows which have the same priority are equalized by the CPE at packet rates and not bit rates (the packet sizes are not taken into account).
14. 20 MHz (10+10) per a single sector is not applicable for 4.9 FCC and should not be used.
15. When performing backhauling over Extreme CPE (i.e. one Extreme base-station feeds an Extreme CPE associated to another Extreme BTS) the following considerations and limitation applies:
16. Backhauling link must be under Eth.CS to ensure management of the bridged BTS
17. Only Integrated ASN-GW can be used
18. It is important to note that the QoS of the backhauling CPE must be set as such it can feed the necessary capacity to the second BTS
19. It is important to design carefully the frequency allocations and potential bands (e.g. for the DCS, and BEST-BS-ID) of the two sectors (the feeding one and the bridged one).
20. Under GPS chaining, when there is a faulty chaining cable, the radio units in the chain may not initiate transmission.
21. Under GPS chaining the master presents GPS External 1PPS and External 10MHz as OK even if the GPS chaining cable is not connected.
22. Under 20 (10+10) MHz - When RF Channels are disabled, the operational status of the radio-channel is presented as Up.
23. Under dual sector SISO base-station, running a spectrum analyzer on one sector may lead as part of the scanning to BTS restart affecting the operation of the second sector.
24. When Number of Channels for Selection is equal with the number of frequencies from Usable Frequencies Table, the DCS will not measure the NI, it will choose randomly one frequency from that table
25. GPS holdover occurs if GPS signal is "lost" and eventually ends when GPS signal is reacquired. In case of frequent reoccurrences of GPS holdover events, the system may develop miss-synchronization that may eventually require BTS reset. Recommended workaround is to minimize GPS holdover events – improving antenna installation location (insure clear sky), use high gain profile antenna
26. When running Spectrum Analyzer while operating in dual sector mode, if system had developed miss-synchronization because of GPS holdover, at the end of the scan process the system would reinitialize both channels.
27. In very rare occasions, the logical BS ID might be reinitiated. This can be observed in the trap events as “No TX/RX” and deregistration of the CPEs associated to this BS ID. The situation is auto recoverable and service is restored after few seconds.
28. When BTS is operating with Release 1.5 and cell range is default (40Km) the CPEs running release 1.2 or previous might fail to perform network Entry.
    Recommendation are:
29. To refrain from such issues upgrade the network according to the SW upgrade procedure, first the CPE than the BTS.
30. Recovery actions (in case BTS was upgraded to 1.5 first):

31. Upgrade also the CPE to Release 1.5 to allow its association to the BTS
32. Modify the cell range in the BTS to 8km would allow association of CPEs running 1.2 firmware
33. If BS Refresh feature is enabled and the network connection to the AAA is lost, the user intervention is required in order to reinitialize the BTS device after the connection with the AAA server is reestablished.

BreezeMAX Extreme PRO 5000 CPE

34. Ping messages of 25000 bytes transmitted over R1 (to the host behind CPE) are sometimes unanswered. There is no issue observed with Ping messages of length up to 14K bytes
35. Software upgrade may fail if the WAN management IP is changed during the software upgrade process
36. Sending IP fragmented packets between the MS and the BTS may result in packet loss
37. Upgrade to Release 1.5 from release 1.1 should be performed via an intermediate version. i.e. from release 1.1 (version 4.6.5.55) to intermediate version (1.2.0.3) and only than to official release 1.5 (version 1.5.1.23)
38. When the sum of all provisioned services exceeds the CPE capacity license, the NE process will not be completed. It is recommended to provision the data and management services considering the total license capacity.
39. CPE capacity license information is available through the WEB interface only. The information is not submitted through the TR069 protocol.

Issues Observed During Interoperability Testing

Radiator AAA

During the Interoperability test with Radiator version 4.4 the following issues were observed. Note that these can be overcome with additional scripts and configuration of the default installed Radiator AAA:

40. Multi-host support behind a single CPE might not work. One may need extra scripts to support multiple host creation in the AAA behind a single CPE.
41. In case of abrupt link termination between the ASN-GW and the AAA, account sessions might remain open (active). One may need to implement timers or other logic scripts in the AAA to close these sessions.

FreeRADIUS AAA

During the Interoperability test with FreeRADIUS version 2.1.8 the following issue was observed:

42. FreeRADIUS default installation (of version 2.1.8) requires modification of several configuration parameters (in different files) to be able to work properly with a WIMAX 16e solution such as the Extreme, for details on required changes please refer to the application note: "Application Note: BreezeMAX Extreme operating with AAA"
43. FreeRADIUS cannot be used together with external 4Motion mini-centralized ASN-GW

Bug Fixes

Release 1.5 described herein, introduces the following bug-fixes:

Base-Station

1. Up to 50 subscribers per BTS
2. Maximum cell radius supported with this release is up to 12km. Cell radius configuration should not be modified from its default value (40km).
3. MAP Repetition isn't supported in this release, using QPSK 1/2 with 0 repetition only (Default value).
4. GPS Chaining is not supported
5. Maintenance actions such as SW Download, Configuration backup/restore may affect dramatically the BTS performance
6. In stress conditions, after many de-registrations, the BTS could perform reset
7. The downlink PER counters cannot be manually reset
8. Counters that were not supported in previous release:
    a. HARQ ACK numbers (Bursts) per MS
    b. HARQ NACK numbers (Bursts) per MS
    c. HARQ drop (Bursts) per MS
    d. TOTAL BURSTS/ ERROR BURSTS per Rate.
9. GPS is not locking the satellites in good conditions
10. In IP-CS mode DHCP Discover packets are sent as L2 unicast

Issues resolved with Release 1.5.1.72 over earlier 1.5 (1.5.1.57) software:

11. BTS disconnects all MS and re-connection cannot be established.
12. Uplink modulation stabilization to enhance cell capacity
13. Downlink rate stabilization on higher modulation schemes to enhance cell throughput capacity
14. GPS chain members may report GPS faults alarms while the system is performing in optimum level of performance
15. BTS radio modem is reinitialized if the user disables from configuration the radio channels.

CPE

16. Performance monitor counters might not update properly within the web page.
17. MS lost synchronization after re-authentication
18. Fixing The Rx/Tx LAN Port Total Bytes/Packets counters of the CPE should not be used, they may display unreliable values
19. After working on the web page of the CPE, it is recommended to perform Logout.
20. Skipping channels from association when BTS ID marked with SNR = 0
21. Not searching for preferred BS once connected to other BS

Issues resolved with Release 1.5.1.23 over earlier 1.5 (1.5.1.16) software:

22. CPE does not associate to a specific BTS ID reporting the status as “Rejected”

23. User configured discrete scan frequencies are not displayed in WEB scan table.
24. In rare occasions the CPE does not acquire a management IP address.
25. CPE reports to be connected even though no BTS has record of it.
26. TR069 protocol method to support “force full scan” command
27. CPE will scan only for BTSs that are currently in the configured frequency scan list
28. Ethernet interface of the CPE will not be reinitialized if ETH-CS services are provisioned for Data traffic

Compatibility Matrix

With Release 1.5 described herein, the following compatibility matrix applies:

	BMAX 5000 CPE ver. 1.5
BTS version	1.1/1.2/1.5

	BMAX 4900 BST ver. 1.5	**BMAX 5400 BST ver. 1.5**
CPE version	4.6*/1.2*/1.5	4.6*/1.2*/1.5

* may require configuring the BTS running 1.5 SW version to cell range of 8km

Note: if any element (CPE or BTS) is not of the recent release (1.5) not all of release 1.5 functionality would be supported.